

Agenda Item: 8
Meeting Date: June 15, 2006

CALIFORNIA BAY-DELTA AUTHORITY

WATER USE EFFICIENCY EVALUATION REPORT

Summary: Staff and consultants of the California Bay-Delta Authority have completed a draft of the *Water Use Efficiency Comprehensive Evaluation* called for in the August 2000 CALFED Bay-Delta Program Record of Decision. This report gives estimates of past and future amounts of water conservation and recycling performance and recommendations for improving water use efficiency programs.

Recommended Action: This is an information item only.

In the summer of 2000, Federal, State and stakeholder representatives negotiating the CALFED Bay-Delta Program Record of Decision (ROD) struggled to resolve differences over the Water Use Efficiency (WUE) Program Element. Some saw WUE as the cornerstone of CALFED's water management strategy. Others saw WUE as important, but not an initiative to be funded with more than \$1 billion in State and Federal funds.

Finally, negotiators reached a compromise: Provide unprecedented funding for WUE, but require an extensive evaluation to assess the program's effectiveness. This report—known as the *Comprehensive Evaluation*—represents a Public Review Draft of the evaluation called for in the ROD. A final version is slated for Summer 2006.

The *Comprehensive Evaluation* is structured to assess the potential of each of WUE's four main components—agricultural water conservation, urban water conservation, recycling and desalination—to contribute to CALFED goals and objectives. The analysis has two main parts: a “look forward” that seeks to determine the potential of WUE actions statewide given different levels of investment and policies, and a “look back” that assesses progress to-date.

List of Attachments

Attachment 1 – Executive Summary and Overarching Finding from the *Water Use Efficiency Comprehensive Evaluation*

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The full report can be found at:

http://www.calwater.ca.gov/Programs/WaterUseEfficiency/adobe_pdf/2006_WUE_Public_Draft.pdf

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PUBLIC REVIEW DRAFT

Water Use Efficiency Comprehensive Evaluation CALFED Bay-Delta Program Water Use Efficiency Element

April 2006

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BACKGROUND

In the summer of 2000, federal, state and stakeholder representatives negotiating the CALFED Bay-Delta Program Record of Decision struggled to resolve differences over the Water Use Efficiency (WUE) Program Element. Some saw WUE as the cornerstone of CALFED's water management strategy. Others saw WUE as important, but not an initiative to be funded with more than \$1 billion in state and federal funds.

Finally, negotiators reached a compromise: Provide unprecedented funding for WUE, but require an extensive evaluation to assess the program's effectiveness. This report—known as the Comprehensive Evaluation—represents a Public Review Draft of the evaluation called for in the August 2000 Record of Decision (ROD). A final version is slated for Spring 2006.

APPROACH

The Comprehensive Evaluation is structured to assess the potential of each of WUE's four main components—agricultural water conservation, urban water conservation, recycling and desalination—to contribute to CALFED goals and objectives. The analysis has two main parts: a “look forward” that seeks to determine the potential of water use efficiency actions statewide given different levels of investment and policies, and a “look back” that assesses progress to-date.

The analysis, conducted by California Bay-Delta staff and consultants with input from CALFED Agencies and stakeholders, is intended primarily to help policymakers target future investments in the WUE Element and develop appropriate assurances. Additionally, the projections generated by the Comprehensive Evaluation are expected to—and already do—feed into other studies, such as the California Water Plan Update.

FINDINGS

The ROD viewed WUE investments as a cost-effective way to

accelerate the implementation of conservation and recycling actions statewide. (Desalination was incorporated into the program at a later date.) More specifically, the ROD suggested that, with extensive federal, state and local investment, WUE might be able to generate between 1.0 to 1.3 million acre-feet in the first seven years of the program.

In reviewing this report, readers need to be aware that the Comprehensive Evaluation was constrained by significant data limitations. For example, there is no comprehensive data related to locally funded actions within the agricultural, desalination and recycling components; only on the urban side is there an extensive database that collects voluntarily reported savings associated with local WUE actions. Similarly, expected benefits associated with grant-funded projects reflect local agency proposed savings; the figures do not represent observed savings. This data gap represents a serious challenge to agencies and stakeholder communities committed to developing a well informed water management strategy. Still, there are important findings to be considered. The Comprehensive Evaluation suggests the following cross-cutting findings:

- Projections strongly support the position that aggressive investment in water use efficiency actions can result in significant reductions in applied water use over the next 25 years. Depending on the level of investment and other policies, the analysis projects savings of 1.4 to 3.2 million acre-feet by 2030: 180,000 to 1.1 million acre-feet for the agricultural sector; and 1.2 million to 2.1 million acre-feet from urban. Additionally, there is very large potential from both desalination and recycling.
- There is solid demand at the local level for state and federal water use efficiency grants. Over the past four years, 235 grants totaling \$305 million have been

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STAGE 1 WATER SAVINGS: PROJECTED VS. EXPECTED					
		ROD Projections	Potential Savings (Modeled)	Expected Savings	Projected Yearly Average Cost per AF of Savings ¹
Agricultural ²	Lower Bound	260,000 AF	180,000 AF	50,000 AF	\$28/AF for in-stream savings; \$350/AF for supply reliability savings ³
	Upper Bound	350,000 AF	250,000 AF	50,000 AF	
Urban	Lower Bound	520,000 AF	267,000 AF	101,000 AF	\$160 to \$340/AF
	Upper Bound	680,000 AF	356,000 AF	142,000 AF	
Recycling	Lower Bound	225,000 AF	Not Modeled	387,000 AF	\$800/AF
	Upper Bound	310,000 AF	Not Modeled	510,000 AF	
Desalination	Lower Bound	Not Modeled	Not Modeled	20,000 AF (no range)	\$957 per AF, on average; range from \$430 to \$1,387
	Upper Bound				

1. Figures based on recent grant-funded projects.
2. The Agricultural WUE figures include the savings and costs associated with both recoverable and irrecoverable savings.
3. The range of per-acre foot average costs associated with ag savings was between \$5/AF and \$112 for in-stream savings, and \$28 to \$515 for water supply reliability savings.

awarded across all four components. The demand for grant funding has repeatedly outstripped the available funds. In the urban sector alone, funding requests from urban water suppliers have exceeded available state/federal funds by a roughly eight-to-one ratio; agricultural requests were double the available funding.

- An analysis of WUE savings over the first seven years (Stage 1) offers a mixed picture. (See table above.) Agricultural and urban WUE show the potential to generate substantial water savings at average costs ranging from \$28 to \$340 per acre-foot, but the overall savings are likely to fall far short of both ROD and Comprehensive Evaluation projections due to three main factors: (1) agricultural and urban grant funding for WUE actions is 80% lower than projected in the ROD; (2) key agricultural and urban assurances actions anticipated in the ROD are not yet implemented; and, (3) local WUE actions are either below projected levels or there is insufficient data to measure progress. Recycling is anticipated to exceed ROD projections, but the cost—\$800 per acre-foot on average—is significantly higher than savings generated through agricultural or urban water use efficiency actions. Savings generated through desalination, also expensive relative to demand management options, averaged \$957 per acre-foot.
- Although grant-funded water savings account for only a small percentage of total savings potential, they leverage significant additional local investment, act as an investment catalyst, help to promote regional part-

nerships and joint ventures, and increase the geographic base of implementation.

- Sufficient project-level baseline data or observed project cost and performance data have not been collected. Therefore, an understanding of progress toward meeting ecosystem restoration, water quality and water supply reliability objectives is not possible. In addition, the lack of project- and program-level data severely limits the use of adaptive management for program improvement.

In addition to these overarching findings, there are several sector-specific findings important to highlight.

AGRICULTURAL WATER USE EFFICIENCY

- Through 2004, the agricultural Proposal Solicitation Package (PSP) grant program funded 60 grants to pursue targeted benefits, research, and education projects. Almost \$18 million in grant funding was awarded by the state; locals contributed \$9.5 million. Applicant-reported annual benefits are approximately 40,000 acre-feet for in-stream flow and timing and more than 10,000 acre-feet for water supply. Benefits are expected to last from 3 to 50 years.
- Approximately 3% of the in-stream flow and timing (ecosystem restoration) benefits identified in the quantifiable objectives are expected through grant funded activity. Approximately 3% of the water quantity (water supply reliability) benefits identified in the quantifiable objectives are expected through grant funded activity.

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- State and federal funds for agricultural WUE grants through Stage 1 are expected to be about 10% of funding amounts identified in the ROD. The amount of agricultural WUE occurring at the local level is not known.
- Realization of agricultural WUE potential depends on locals implementing cost-effective actions. However there is no comprehensive reporting of water conservation benefits available from state or federal water management plans and, therefore, the extent of non-CALFED-funded WUE is not known. There are no centralized data repositories to assess progress at the farm level.
- The average cost per acre-foot of savings appears to be within the range expected by the ROD. Costs for providing the in-stream flow benefits ranged from \$5 to \$200 per acre-foot. Costs for water supply reliability benefits ranged even more widely. One funded project provided reductions in recoverable flows at a cost of \$28 per acre-foot. Projects that reduced irrecoverable losses ranged in cost from \$230 to \$515 per acre-foot.
- Significant funding was provided under other non-CALFED programs that potentially met CALFED WUE objectives. Almost \$80 million was provided by other state and federal programs for grants and technical assistance related to agricultural water use efficiency. Local agencies and growers provided another \$168 million in cost-sharing under these programs.
- Had local water suppliers also pursued all locally cost-effective conservation measures per the ROD, total urban sector savings by the end of Stage 1 could have ranged between 267,000 to 356,000 acre-feet—about two and a half times what is likely to be realized.
- The Comprehensive Evaluation also highlights the important role played by efficiency codes. Once in place, these codes provide an automatic and on-going source of water savings to the state at minimal costs. Codes related to toilet, showerhead, and washer efficiency, as well as codes that require metering customer water connections, account for 46% to 84% of the anticipated savings in the projections of long-term water savings potential.
- The impact of the Urban Memorandum of Understanding (MOU) is varied. On the one hand, more than 190 urban water suppliers—representing two-thirds of all Californians—have now signed the Urban MOU and annual water savings tied to implementation of urban Best Management Practices (BMPs) have increased by 15% to 20% annually since 1991. Still, the impact of the MOU has varied considerably by region and rates of compliance for most BMPs remain low. BMP data strongly suggest the MOU process is not working as intended and its impact on urban water use remains well below its full potential.
- The ROD called on CALFED Agencies to implement a process to certify water supplier compliance with the Urban MOU by the end of 2002. It further stated that access to CALFED Agency grant funding should be conditional on compliance with the Urban MOU once the certification process was in place. Although agencies and stakeholders proposed a consensus approach to urban certification, to date these ROD provisions have not been implemented.
- While unit costs for many funded projects have been higher than anticipated by the ROD, on average the cost per acre-foot of expected water savings has ranged between \$160 to \$340 per acre-foot. The average unit cost of savings for the urban PSP program is within the expected cost range of \$150 to \$450 per acre-foot cited in the ROD. The evaluation raises questions regarding the efficacy of funding many small- to medium-scale projects with high unit costs versus funding fewer, larger projects with greater opportunities for economies of scale.

URBAN WATER USE EFFICIENCY

- Through 2004, the urban PSP grant program has funded 122 urban conservation implementation, research, and education projects. \$50.5 million in grant funding has been awarded over this period. Urban conservation projects funded by the PSP process account for between 16% to 19% of total expected water savings through the first four years of Stage 1. The other 81% to 84% of expected savings are a result of unassisted local implementation. Grant funded projects have expected annual water savings of about 37,000 acre-feet. Total urban water savings from grants and unassisted local implementation through Stage 1 are expected to range between 101,000 to 142,000 acre-feet.
- State and federal funds for urban grants through Stage 1 are expected to be about 23% of funding amounts set forth in the ROD. Comprehensive Evaluation results suggest that had the urban PSP program received full Stage 1 funding, grant-funded savings alone could have generated as much as 125,000 acre-feet of water savings by the end of Stage 1.

RECYCLING AND DESALINATION

- Any assessment of recycling and desalination potential is greatly constrained by significant data limitations. While stakeholder listings of likely projects suggest strong poten-

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tial, it is important to recognize that these projections assume continued funding through Proposition 50 and local project sponsorship. It is also important to keep in mind that the listings are not definitive and some of the projects may be speculative in nature. None of the data is observed or verified.

- Near-term benefits from recycling are proposed to range from 387,000 to 513,000 acre-feet. This is almost double the low end of the Stage 1 estimates, a fact that is likely tied to higher-than-expected funding levels. Desalination projects are expected to generate 20,000 acre-feet. (These are projects to come online as a result of Proposition 50 Funding only.)
- The Comprehensive Evaluation's projection of recycling and desalination potential strongly supports the position that aggressive investment can result in significant water supply benefits through 2030. A list of potential and existing recycling projects identified by stakeholders suggests there are 730 projects throughout the state, with 565 projects reporting a potential yield of more than 3 million acre-feet. The desalination list suggests there are 174 potential and existing projects throughout the state with a reported yield of more than 1.6 million acre-feet.

RECOMMENDATIONS

The analysis and associated findings and considerations suggest that agencies responsible for the WUE Program may want to consider changes in the way the program is implemented. Below are specific recommendations that the consultant Team believes merit serious consideration. Any final approach is best considered as part of a dialogue that brings the affected stakeholder community to the table in a transparent series of discussions. The recommendations—provided at the request of DWR staff and described in greater detail at the end of the Overarching Section—fall into four main categories:

PROGRAM STRUCTURE/ASSURANCES

The Comprehensive Evaluation suggests program implementers should consider three specific recommendations related to program structure and assurances. They are: (1) assess the viability of the grant-driven WUE approach given expected state and federal fiscal constraints; (2) determine whether to implement a process to certify compliance with the Urban MOU; and, (3) revisit the effectiveness of the quantifiable objectives approach and associated assurances.

MONITORING PERFORMANCE

Data gaps and limited program assessments greatly handicap effective program implementation. To remove this important barrier, WUE Program implementers are encouraged to consider the following: (1) develop and track specific performance measures for the WUE Program; (2) where fiscally feasible, move forward with the broadly supported package of administrative and legislative water use measurement actions; (3) improve collection of data on locally funded actions; and, (4) revise the grant process to more closely monitor, verify and track results.

FINANCIAL ASSISTANCE PROGRAM

A review of WUE financial assistance programs suggests that there is insufficient information to determine the extent to which current grant and loan programs are supporting WUE Program objectives. Based on the Comprehensive Evaluation findings, implementation agencies are encouraged to (1) revisit grant program structure and protocols, and (2) determine the need, efficacy and structure of WUE loan programs.

TECHNICAL ASSISTANCE AND RESEARCH

The Comprehensive Evaluation suggests that both technical assistance and research efforts to-date have consisted of a patchwork of initiatives. Agency implementers are encouraged to consider the following recommendations related to these important tasks: (1) evaluate WUE research funded activities to-date, identify research priorities for the next program stage, and establish protocols to disseminate research findings and (2) conduct a market assessment to determine the appropriate structure and scope of technical assistance programs and develop a strategic plan for implementation.

NEXT STEPS

Interested stakeholders are invited to review the accompanying Public Review Draft and submit any comments to the California Bay-Delta Authority for its consideration as it continues discussions related to this important topic. Staff will consider comments received and amend the final version, as appropriate. To the extent public comments reflect substantially differing perspectives or staff does not believe the comments warrant further revisions to the document, the final version of the Comprehensive Evaluation also will include an appendix summarizing the range of feedback and its rationale for not incorporating substantive suggestions.

INTRODUCTION

BACKGROUND

In 2000, as federal, state and stakeholder representatives negotiated the CALFED Bay-Delta Program Record of Decision (ROD), participants voiced very different views of the newly minted Water Use Efficiency (WUE) Element.

Some participants saw the WUE Element as the cornerstone of CALFED's water management strategy. These individuals called for, among other policies, extensive grant and loan funding to spur more aggressive local water use efficiency actions. Other participants saw WUE as important, but not necessarily a primary focus of the CALFED Program and certainly not an initiative to be funded with more than \$1 billion in state and federal funds.

As the negotiators hammered out the final agreement that eventually was codified in the August 2000 ROD, they reached a compromise: Provide unprecedented funding to the WUE Element, but require an extensive evaluation after several years to assess the program's effectiveness:

"....by December of 2004 CALFED Agencies will conduct a comprehensive evaluation of the [WUE] Program's first 4 years, and will make appropriate additional State and Federal investments and actions to assure continued aggressive implementation of water use efficiency measures in the State."

This report—known as the Comprehensive Evaluation—represents a Public Review Draft of the evaluation called for in the August 2000 Record of Decision. A final version is expected in early 2006.

THE WATER USE EFFICIENCY ELEMENT

The WUE Element described in the ROD is unique nationally in its magnitude and its aggressive approach to water management. The WUE Program—one of eleven CALFED

Program Elements—consists of agricultural, urban, urban wastewater recycling (recycling) and managed refuges components. In 2003, desalination was added to the program to take advantage of ongoing efforts by Department of Water Resources' (DWR) Office of Water Use Efficiency and the State Water Resources Control Board (SWRCB).

The WUE Element has three main goals that support the overall CALFED effort: (1) reduce water demand through "real water" conservation, (2) improve water quality by altering volume, concentration, timing and location of return flows, and (3) improve ecosystem health by increasing in-stream flows where necessary to achieve targeted benefits. The program is based on the recognition that, although efficiency measures are implemented locally and regionally, the benefits accrue at local, regional and statewide levels.

The ultimate goal of the WUE Element is to develop a set of programs and assurances that contribute to CALFED goals and objectives, has broad stakeholder acceptance, fosters technically and economically efficient water use, and helps support a sustainable economy and ecosystem.

THE COMPREHENSIVE EVALUATION

Most broadly, the Comprehensive Evaluation is intended to provide a thorough look at the WUE Element—both its effectiveness to-date and its potential to contribute to CALFED's effort to develop a long-term, comprehensive plan to restore the ecological health and improve water management for beneficial uses of the Bay-Delta system. More specifically, information developed through the analysis can help policymakers target future investments in the WUE Element and develop appropriate assurances.

Additionally, water use efficiency projections generated by the Comprehensive Evaluation are expected to—and already do—feed into other related studies, including: (1) the DWR's work on the California Water Plan Update; (2) Common

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Assumption modeling for the ongoing surface storage investigations; and, (3) the long-term Environmental Water Account's Environmental Impact Report.

To meet these various purposes, the Comprehensive Evaluation is structured to both assess performance to-date and project future potential for each of WUE's four components: agricultural water use efficiency, urban water use efficiency, recycling and desalination. These facets of the analysis, referred to as the "look-back" and "look-forward" are described briefly below. (A more detailed explanation of how these analyses were undertaken—data sources, methodologies and critical assumptions—are provided in Volumes 1 through 3 of this document.)

LOOK-FORWARD

The aim of the California Bay-Delta Authority's (CBDA) "look-forward" effort is to answer the question: What is the potential of water use efficiency actions statewide given different levels of investment and policies? In other words, the WUE Element is striving to develop a range of projections that reasonably bracket potential water use efficiency savings over the next 25 years or so. To generate a "reasonable bracket" of water use efficiency projections, the evaluation undertakes a series of analyses that assume differing levels of investments and different policy actions.

LOOK-BACK

The look-back effort consists of a process and impact evaluation based on what the WUE Element accomplished through its grants, loans and technical assistance efforts between 2000 and 2004. The process evaluation looks at how the program is structured and operated, assesses the program's effectiveness, and draws implementation lessons. The impact evaluation includes: an activity accounting; a flow-path analysis of CALFED funded grants, loans, and technical assistance; and results of various surveys. The geographic and temporal extent of the look-back effort depends on the availability of data but generally covers the state.

Though the look-forward analysis was conducted first—data from the look-forward was needed early on to inform the California Water Plan Update—information gleaned from the look-back analysis was used to re-assess the look-forward findings and shape the Comprehensive Evaluation's overarching conclusions and considerations.

INPUT INTO THE COMPREHENSIVE EVALUATION

The Comprehensive Evaluation was conducted primarily by CBDA staff and consultants. However, recognizing the sen-

sitivity and complexity of the Comprehensive Evaluation and the need for extensive input, the team coordinated with staff from the DWR, the US Bureau of Reclamation (USBR), the SWRCB and the Natural Resources Conservation Service (NRCS). The team also coordinated with CALFED Agency staff to ensure data generated through the Comprehensive Evaluation was in a format beneficial to ongoing studies such as the California Water Plan Update and the Common Assumptions modeling.

The specific public outreach efforts undertaken to explain and seek feedback on the proposed approach included:

WATER USE EFFICIENCY SUBCOMMITTEE MEETINGS

Staff and consultants met with the WUE Subcommittee on several different occasions to lay out their proposed methodology, seek feedback on critical assumptions and present preliminary look-forward results.

PUBLIC WORKSHOPS

In coordination with the WUE Subcommittee, staff and consultants held general workshops to present and seek feedback on their analytic approach to generating projections for agricultural water use efficiency, urban water use efficiency, recycling, desalination and regulated deficit irrigation (RDI).

It is important to note that while this document has been reviewed in its entirety by relevant CALFED agencies, stakeholders have only had the opportunity to review and comment on certain sections and findings. For that reason, this version is considered a Public Review Draft. Further review and revision is anticipated.

REPORT STRUCTURE

The Comprehensive Evaluation is presented in a format intended to make it easy for interested readers to look both in-depth at and across each of the four different WUE components. Accordingly, the report is divided into two main sections: Overarching Findings of each component and Volumes that cover the look-back and look-forward Analysis for each component.

The *Overarching Findings* presents a summary of the primary findings and any overarching considerations generated by the evaluation. At the request of DWR staff, it also includes specific recommendations that the consultant Team believes merit serious consideration.

The *Volumes* are structured similarly. The first portion focuses on the look-back, starting with an overview of the Program's implementation approach, a brief review of pre-ROD activities and then a detailed assessment of activities, impact to-date and comparison with ROD estimates. The

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second section focuses on the look-ahead, laying out the different projection levels studied, the methodology and data used, and the study results. The final sections of volume 1 and volume 2 present relevant appendices.

The volume on recycling and desalination is greatly streamlined in comparison to the agricultural and urban water use efficiency volumes due to significant data limitations.

The evaluation looks carefully at activities implemented by the DWR (primary implementer of agricultural and urban water conservation and desalination), the Bureau of Reclamation (limited grant activity and technical assistance dedicated to Central Valley Project Improvement Act contractors), the State Board (grants and loans targeted at recycling), NRCS (local technical assistance) and the CBDA (oversight and coordination).

NEXT STEPS

Interested stakeholders are invited to review the accompanying Public Review Draft and submit any comments to the CBDA for its consideration as it continues discussions related to this important topic.

Staff will consider comments received and amend the final version, as appropriate. To the extent public comments reflect substantially differing perspectives or staff does not believe the comments warrant further revisions to the document, the final version of the Comprehensive Evaluation also will include an appendix summarizing the range of feedback and its rationale for not incorporating substantive suggestions.

ACRONYMS

AB 1658	California Agricultural Water Management Planning Act of 1986
AB 3616	Agricultural Efficient Water Management Act of 1990
AF	acre-feet
AWMC	Agricultural Water Management Council
AWWARF	American Water Works Association Research Foundation
BDPAC	Bay-Delta Public Advisory Committee
BMPs	Best Management Practices
CBDA	California Bay-Delta Authority
CII	Commercial, Industrial, Institutional
CIMIS	California Irrigation Management Information System
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CUWCC	California Urban Water Conservation Council
DWR	Department of Water Resources
EQIP	Environmental Quality Incentive Program
ET	evapotranspiration
ETAW	Evapotranspiration of Applied Water
EWMPs	efficient water management plans
FACA	Federal Advisory Committee Act
IID	Imperial Irrigation District
MOU	Memorandum of Understanding
NRCS	Natural Resources Conservation Service
PSP	Proposal Solicitation Package
QOs	Quantifiable Objectives
RDI	Regulated Deficit Irrigation
ROD	Record of Decision
SAE	seasonal application efficiency
SB 23	Senate Bill 23
SWRCB	State Water Resources Control Board
TAF	Thousand Acre-feet
TBs	Targeted Benefits
ULF	ultra-low flush
WUE	Water Use Efficiency
USBR	US Bureau of Reclamation
USFWS	US Fish and Wildlife Service
UWMPA	Urban Water Management Planning Act
VITIS	VITicultural information system

OVERARCHING FINDINGS

AGRICULTURE

INTRODUCTION TO AGRICULTURAL WUE COMPREHENSIVE REVIEW

The Agricultural Comprehensive Review is in two parts. The first part provides a review and evaluation of the first four years of agricultural Water Use Efficiency (WUE) implementation. The review discusses the role of agricultural WUE as described by the CALFED Record of Decision (ROD); the structure of the agricultural WUE program; implementation of this program; and program results over the first four years of implementation and anticipated by the end of Stage 1 of the CALFED Program. The second part provides an analysis of agricultural WUE potential through 2030 for six different projections of state and federal funding along with local levels of investment in agricultural WUE. The intent of these projections is to bracket the expected range of WUE given existing and reasonably foreseeable levels of state and federal investment deemed consistent with the ROD and state and federal fiscal constraints.

This overarching findings section briefly describes the agricultural WUE program structure and potential envisioned by the ROD, and then summarizes results of the two parts of the agricultural comprehensive review and addresses the efficacy of the current agricultural WUE program structure. It concludes with considerations for the future direction and structure of the agricultural WUE program.

AGRICULTURAL WUE PROGRAM STRUCTURE AND STAGE 1 SAVINGS POTENTIAL ENVISIONED BY ROD

The CALFED ROD states that the goal of the WUE Program is to accelerate the implementation of cost-effective actions to conserve and recycle water throughout the State. The ROD recognizes that WUE can have water supply benefits, water quality benefits, and in-stream flow and timing benefits. The

ROD calls for the implementation of WUE initiatives to achieve these benefits, such as agricultural quantifiable objectives.¹ The ROD calls for the CALFED Agencies to implement a competitive grant and loan program as the best mechanism to assure cost-effective investments in water use efficiency. It further states that:

- Loans and technical assistance are appropriate to help local agencies pursue locally cost-effective WUE.
- Grants are appropriate to pursue WUE that, while not locally cost-effective, provide additional statewide benefits, including water supply, water quality, and in-stream flow and timing.
- CALFED agencies should tailor the required local cost-share requirements to reflect the distinction between local and statewide benefits of a funded project.
- Each grant and loan package must include specific requirements for performance and accountability.

Additionally, the ROD directed that:

- The WUE program shall develop recommendations for appropriate measurement of agricultural water use and submit them to the Legislature for action.
- CALFED Agencies (DWR and Reclamation) will establish specific milestones, and associated benefits, remedies and consequences to track and guide the implementation of the agricultural WUE Program. CALFED Agencies will put in place a stakeholder and agency work group to accomplish this work.
- CALFED agencies (DWR and Reclamation) shall work with the Agricultural Water Management Council to provide technical assistance to agricultural districts devel-

1. ROD, pg. 59.

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- oping management plans under the AB 3616 process.
- The WUE program shall develop a finance plan for completion of Stage 1 actions.
 - CALFED Agencies will conduct a comprehensive evaluation of the Program's first 4 years.

Historically there was a disagreement on the approach toward WUE implementation between irrigators and those that advocate strict implementation of WUE practices such as the efficient water management practices (EWMPs). Advocates of the strict approach feel that forcing water suppliers to undertake a list of practices will result in improved WUE. On the other hand, end users feel that changes should occur based on profit or return-on-investment. In the past the objectives that the water user focused on were internal in nature, such as how will the improvements benefit the bottom line. The CALFED agricultural WUE program moved the emphasis of the objective approach to one that looks to provide benefits beyond the water user. In addition, the CALFED WUE approach places a heavy emphasis on results and verification of all efforts. Although there are some successes, this approach is in its infancy in program development, outreach and implementation.

The Agricultural WUE component centers its strategy on: encouraging water users and water suppliers to implement locally cost-effective EWMPs; and providing funding to foster implementation of practices that provide statewide benefits beyond what is achieved through locally cost-effective practices. The program recognizes that, although efficiency measures are implemented locally and regionally, the benefits accrue at local, regional, and statewide levels. The Program is designed to:

- Build on existing water management programs
- Achieve multiple benefits, including water quality improvement, water supply reliability, and ecosystem restoration
- Reduce existing irrecoverable flows
- Preserve local flexibility
- Use incentive-based actions over regulatory actions
- Provide assurance of high water use efficiency

The WUE program is structured to help achieve the CALFED goals by developing objectives associated with water quantity, water quality, and in-stream flow benefits. Technical work was designed to translate the CALFED goals into more specific objectives. Using a stakeholder group that included agricultural and environmental interests, the program developed specific categories of benefits that could be addressed by agricultural WUE. Where possible, these benefits are expressed quantitatively as acre-feet of water at specific locations for specified time periods. The outcome

of this effort is a set of objectives called the targeted benefits and quantifiable objectives.² The program envisioned that the grants and technical assistance components would be implemented to achieve the objectives, and that the program would be evaluated based largely on its effectiveness in achieving the objectives.

LONG-TERM AGRICULTURAL WUE POTENTIAL

The Comprehensive Review's six projections of agricultural WUE potential strongly support the position that aggressive investment in agricultural WUE can result in significant reductions in irrecoverable flows (flows to saline sinks and non-beneficial evapotranspiration) and recoverable flows (in-stream flow and timing changes primarily achieved through changes to diversions, return flows and seepage) through 2030. These projections evaluated agricultural WUE potential from: (1) Local implementation of EWMPs as well as other locally cost-effective WUE actions; and (2) additional agricultural WUE actions co-funded through CALFED agency grant programs.

The first five projections adopted different assumptions regarding public (state and federal) and local investment rates. The sixth projection is a technical potential that assumes 100% adoption of all WUE actions. This last projection serves as a reference point or bookend to evaluate the other five. In addition, there is an analysis of the potential to use regulated deficit irrigation (RDI) to achieve reductions in non-productive evapotranspiration (ET). Water use efficiency potential for the projections are given in Table 1.1. The results of the projections analysis indicate the following:

- Agricultural WUE actions for projection levels 1, 3 and 5 can generate by 2030 between 150,000 and 947,000 acre-feet of recoverable flows (or 3% to 21% of the technical potential) and 34,000 and 190,000 acre-feet of irrecoverable flows (or 2% and 10% of the technical potential).
- Application of regulated deficit irrigation techniques on amenable crops is projected to yield approximately 142,000 acre-feet of reductions in non-productive ET. This water is then available for other beneficial uses such as transfers or consumptive use.
- All projection levels show potential to meet a portion or all of the in-stream flow needs identified in the targeted benefits.

EXPECTED STAGE 1 AGRICULTURAL WUE RESULTS

Regarding Stage 1 agricultural WUE potential, the Comprehensive Review concluded the following:

2. A full explanation of the process used and the benefit listing is available at www.calwater.ca.gov/Archives/WaterUseEfficiency/WaterUseEfficiencyQuantifiableObjectives.shtml.

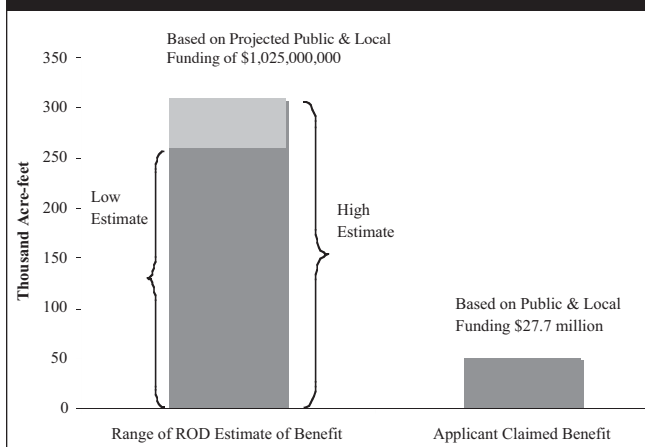
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TABLE 1.1 CBDA ESTIMATES OF 2030 ON-FARM AND DISTRICT AGRICULTURAL WUE POTENTIAL

Projection Level (PL)	Local Agency Investment Assumption	CALFED Grant Funding Assumption	Recoverable Flows (1,000 acre-feet/year)	Irrecoverable Flows (1,000 acre-feet/year)	Regulated Deficit Irrigation (1,000 acre-feet/year)
1	Historic Rate	Proposition 50 only	150	34	142
2	Locally Cost-Effective	Proposition 50 only	No change in locally cost-effective rate—results same as PL 1		
3	Historic Rate	Proposition 50 + \$15 million/year	565	103	142
4	Locally Cost-Effective	Proposition 50 + \$15 million/year	No change in locally cost-effective rate—results same as PL 3		
5	Locally Cost-Effective	Proposition 50 + \$40 million/year (2005–14) \$10 million/year (2015–30)	947	190	142
6*	\$1.592 billion annually		4,338	1,819	142

* Projection 6 estimated the technical potential of agricultural WUE. It assumed 100% adoption statewide. Funding assumptions are based on implementation costs and are not divided between local and public funding.

FIGURE 1.1 STAGE 1 AGRICULTURAL WUE: ROD ESTIMATES AND APPLICANT-CLAIMED BENEFITS



- Benefits from agricultural WUE are expected to fall well short of the both the ROD and Comprehensive Review Stage 1 estimates of WUE potential. Figure 1.1 compares expected agricultural WUE benefits by the end of Stage 1 based on the review of the first four years of agricultural WUE implementation to the ROD and Comprehensive Review estimates of Stage 1 potential. The difference between the ROD and results of the first four years of implementation are partially due to program funding that was lower than the projected need. In addition key assurances actions anticipated in the ROD are not yet implemented; local actions are either below projected levels or there is insufficient data to measure progress; and insufficient linkage between grant-funding decisions and water suppliers' implementation of locally cost-effective actions.
- Projects funded by the agricultural WUE grants are

estimated to provide about 40,000 acre-feet of in-stream flow benefits for ecosystem restoration. Depending upon the project these benefits are expected to last from 7 to 50 years.

- Projects funded by the agricultural WUE grants are estimated to provide about 10,400 acre-feet of water supply reliability benefits. These benefits constitute both recoverable and irrecoverable flow and are expected to last from 3 to 30 years.
- Approximately 3% of the in-stream flow and timing (ecosystem restoration) benefits identified in the quantifiable objectives are met through grant funded activity. Approximately 3% of the water quantity (water supply reliability) benefits identified in the quantifiable objectives are met through grant funded activity.
- Providing the water supplier and user community with specific objectives resulted in funding requests for pursuing the identified targeted benefits.
- Significant funding was provided under other non-CALFED programs that potentially meet CALFED WUE objectives. Almost \$80 million was provided by the Natural Resources Conservation Service (NRCS), State Water Resources Control Board (SWRCB) and Department of Water Resources' (DWR) drainage program for grants and technical assistance related to agricultural water use efficiency. Local agencies and growers provided another \$168 million in cost-sharing under these programs. No data is available on non-federal, non-state investment in agricultural WUE.

AGRICULTURAL WUE PROGRAM OUTCOMES

The Comprehensive Review found that expected agricultural WUE by the end of Stage 1 is likely to fall short of estimat-

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ed potential. Agricultural WUE benefits are expected to come from two sources: implementation of locally cost-effective practices; and implementation of additional actions primarily funded through state and federal grants. In addition technical assistance was identified as a necessary component for program implementation.

Implementation of locally cost-effective EWMPs and on-farm practices were to provide a base level of WUE and the CALFED financial assistance programs would add to this base. Thus an analysis of agricultural WUE during the first four years of the program is divided into two categories: (1) savings realized through local implementation of cost-effective EWMPs and on-farm actions; and (2) savings realized through CALFED financial assistance programs. In both instances, the Comprehensive Review found substantial discrepancies between planning estimates of Stage 1 WUE potential and actual implementation. This section uses available data to evaluate WUE for both categories.

Technical assistance supports the implementation of the WUE program. At the local level, technical assistance provides agencies and end users the necessary tools and information to address the program objectives. There are two main vehicles for technical assistance—the Agricultural Water Management Council (AWMC) and the state and federal agencies implementing the program: the NRCS, the DWR and the Bureau of Reclamation (Reclamation).

An independent audit of local agency water conservation plans, managed by the AWMC, found that most participants were in compliance with the intended language of the respective requirements. However, there is no comprehensive reporting of water conservation benefits available from water management plans and therefore the extent of non-CALFED funded WUE is not known. There are no centralized data repositories to assess progress at the farm level.

Agricultural WUE Financial Incentive Program

The second component of the WUE program for the agricultural sector was a competitive loan and grant program to support local implementation. The WUE Preliminary Implementation Plan assumed the ROD funding level of \$513 million through Stage 1 for agricultural loans and grants. Outcomes of agricultural WUE incentive program are as follows:

- A competitive Proposal Solicitation Package (PSP) process for agricultural *grants* was developed by CALFED Agencies and was operated over the first four years of Stage 1. CALFED agencies developed an agricultural *loan* program to support implementation of locally cost-effective actions. However, no applications were received for the loans.
- Through 2004, the agricultural PSP *grant* program

funded 63 grants to pursue targeted benefits, research, and education projects. Approximately \$18.5 million in grant funding was awarded by the state; locals contributed \$9.5 million.

- The majority of the awarded *grant* funds were for implementation projects that pursue targeted benefits. Other grant funds were used for research and general agricultural WUE support. Of the \$17.8 million awarded from 2001–04, \$13.4 million was awarded to implementation projects pursuing targeted benefits.
- Applicant reported annual benefits are approximately 40,000 acre-feet for in-stream flow and timing and more than 10,000 acre-feet for water supply. Benefits are expected to last from 3 to 50 years. These benefits have not been compared with project reports nor have they been field verified.
- The amount of agricultural WUE occurring at the local level is not known at either the user or water supplier level. There are no readily available, compiled sources of information that identify ongoing efforts.
- State and federal funds for agricultural WUE grants through Stage 1 are expected to be about 10% of the funding amounts identified in the ROD. Grant funding requests from local water suppliers exceeded the available public funds by a ratio of about two-to-one during the first four years of program implementation. Since the majority of the non-funded projects were research and demonstration it is not clear if additional funding would have generated benefits.
- Costs for providing the in-stream flow benefits ranged from \$5 to \$200 per acre-foot. Costs for water supply reliability benefits ranged even more widely. One funded project provided reductions in recoverable flows at a cost of \$28 per acre-foot. Projects that reduced irrecoverable losses ranged in cost from \$230 to \$515 per acre-foot. These cost estimates are based on information supplied by the applicant and have not been verified.
- There is no mechanism within the PSP to verify that the applicant-claimed benefits are realized. The Bay-Delta Public Advisory Committee endorsed the agricultural assurances package called for in the ROD. However, there has been no discernible effort to utilize the PSP to pursue the assurance commitments.
- An independent panel of water use measurement experts developed a definition of appropriate agricultural water use measurement. Using the product of the independent panel, stakeholders and the BDA board recommended an implementation approach that included administrative and legislative actions. Although legislation was introduced no progress was made on implementing these actions.

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- The average costs of funded projects are within the cost range expected by the ROD. However, this cost information is based on a bare minimum of data points by grant applicants and has not been verified.
- The program does not market the loan program to support implementation of locally cost-effective actions.
- There is no mechanism that takes the results of publicly funded project results and aggregates them to inform program performance and accountability. There are no existing data sources to inform the baseline performance of agricultural WUE.

CONSIDERATIONS FOR MOVING FORWARD

The results of the Comprehensive Review suggest several considerations for moving forward with the agricultural WUE program.

- The Comprehensive Review's projections of agricultural WUE potential affirm the important role that irrigation water management can play in managing the state's water resources over the next several decades. Savings of recoverable flows for projections 1, 3 and 5 range from 150,000 to 947,000 acre-feet, thereby capturing between 3% and 21% of the technical potential. Savings of irrecoverable flows for projections 1, 3 and 5 range from 34,000 to 190,000 acre-feet, effectively capturing between 2% and 10% of the technical potential.
- Realization of this potential depends in part on locals implementing cost-effective actions. The quantitative benefits of the AWMC and Reclamation planning processes are not known. There are no data sets that indicate the contribution of local WUE baseline (such as the information contained in the AWMC plans) and project-level implementation data (such as pre- and post-canal lining seepage flows) that are needed to report on the WUE that occurs at the local level.
- The Comprehensive Review suggests that state and federal financial assistance programs play an important role in affecting WUE. On their own, grant programs are unlikely to allow the state to realize the upper-end of the range of the WUE potential. In conjunction with policies promoting implementation of locally cost-effective WUE, state and federal financial assistance can leverage additional local investment to promote the most promising and cost-effective actions.
- The agricultural assurances package that identifies the benefits that ensure that water suppliers and users are performing at the locally cost-effective level is fundamental to maintaining an objective program. Currently there is insufficient data and information to

establish a baseline or to assess the progress-to-date in program delivery and performance. The assurance package is important in that it would provide the agricultural and environmental community the assurance that the program's efforts are affecting change.

URBAN

INTRODUCTION TO URBAN WUE COMPREHENSIVE REVIEW

The urban comprehensive review is in two parts. The first part provides a review and evaluation of the first four years of urban WUE implementation, discussing the role of urban WUE as described by the CALFED Record of Decision (ROD); the structure of the urban WUE program; implementation of this program; and program results over the first four years of implementation and anticipated by the end of Stage 1 of the CALFED Program. The second part provides an analysis of urban conservation potential over the next 25 years for six different projections of state/federal funding and local levels of investment in urban WUE. The intent of these projections is to bracket the expected range of water savings given existing and reasonably foreseeable regulatory requirements affecting urban water use efficiency, the set of existing Best Management Practices (BMPs) as governed by the Urban MOU, other proven water saving technologies, and alternative levels of state/federal investment deemed consistent with the ROD and state/federal fiscal constraints. It concludes with considerations for the future direction and structure of the urban WUE program.

URBAN WUE PROGRAM STRUCTURE AND STAGE 1 SAVINGS POTENTIAL ENVISIONED BY ROD

The ROD viewed WUE investment in the urban sector as a cost-effective way to better balance urban water supply and demand in the near-term, especially compared to surface storage and major conveyance improvements that the ROD estimated would take at least 5–10 years to complete.³ There were several reasons cited for this view:

- WUE was seen as a way to quickly address growing urban water demands and simultaneously reduce pressure on Delta resources caused, in part, by these demands.
- Relieving pressure on Delta resources through urban WUE investments was not new to the ROD. The ROD's proposed urban WUE approach was built upon earlier urban conservation initiatives that stemmed from Bay-Delta conflicts, most notably the Memorandum of Understanding Regarding Urban Water Conserva-

3. ROD, pg. 59.

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Urban Best Management Practices

BMP 1	Residential Survey Programs
BMP 2	Residential Plumbing Retrofit
BMP 3	System Water Audits
BMP 4	Metering w/Commodity Rates
BMP 5	Large Landscape Conservation
BMP 6	High Efficiency Clothes Washers
BMP 7	Public Information Programs
BMP 8	School Education Programs
BMP 9	Commercial Industrial Institutional
BMP 10	Wholesaler Agency Assistance Programs
BMP 11	Conservation Pricing
BMP 12	Conservation Coordinator
BMP 13	Water Waste Prohibitions
BMP 14	Residential Ultra-Low Flush Toilet Replacement Programs

tion in California (Urban MOU). The Urban MOU had been in effect since 1991 and had achieved widespread adoption.

- Over 190 urban water suppliers, serving approximately two-thirds of all Californians, have now signed the Urban MOU and are implementing its urban conservation BMPs to some degree. The BMPs have also been adopted for use in several other water management initiatives and legislation, including the Urban Water Management Planning Act (UWMPA), the Central Valley Project Improvement Act (CVPIA), and the Sacramento Water Forum Agreement.⁴

Using the Urban MOU process as a starting point, the ROD proposed a two-pronged approach for urban WUE.⁵ The first prong was implementation of locally cost-effective BMPs by urban water suppliers. This base level of implementation was to be supported by CALFED through a program to certify water supplier compliance with the Urban MOU, low-interest loan programs and technical assistance. The second prong was the use of grants to leverage additional local investment in urban conservation. These grants were to go towards measures that, while not locally cost-effective from the perspective of an individual water supply agency, would provide statewide water supply, water quality, and ecosystem restoration benefits.

According to the ROD, these two initiatives had the potential to produce substantial urban water savings by the end of Stage 1. It described the approach as “aggressive and unprecedented nationally.”⁶ State and federal expenditures for urban WUE through Stage 1 were estimated at \$350 million. Local investment was projected to easily exceed this amount. Resulting water savings by the end of Stage 1 were expected to range between 520,000–680,000 acre-feet,

enough water to meet the domestic water demands of 2.7 to 3.5 million Californians.

LONG-TERM URBAN SAVINGS POTENTIAL

The Comprehensive Review's six projections of urban savings potential strongly support the position that aggressive investment in urban conservation can result in significant reductions in urban applied water use over the next 25 years. These projections evaluated urban water savings potential from three sources: Efficiency codes that require certain water using appliances and fixtures to meet specified levels of efficiency; local implementation of BMPs as well as other locally cost-effective conservation measures; and additional urban conservation measures co-funded through CALFED Agency grant programs.

The first five projections adopted different assumptions regarding state/federal and local investment rates. The sixth projection measured the water savings potential assuming 100% adoption of the measures under evaluation. This last projection served as a reference point from which to evaluate the other five. Water savings potential for the six projections are shown in Table 1.2. The results of the projections analysis indicate the following:

- Water savings for projections 1 through 5 range between 1.2 million and 2.1 million acre-feet per year by 2030, and capture 39% to 68% of technical potential. The projected range of savings would meet the domestic water demands of 6.3 million to 10.9 million residents at current rates of household water use.
- While California's population is projected to increase 35% by 2030, urban water use would increase by only 12% if California were to realize the upper-end of the range of projected urban water savings (i.e. Projection 5).
- Water savings from local agency implementation are sharply affected by the local investment assumption. Realizing the upper-end of the range of savings potential requires full implementation of locally cost-effective BMPs (Projections 2, 4, and 5). The analysis indicates that historic rates of investment in BMPs would not be adequate to realize the upper-end of the savings range (Projections 1 and 3). Savings potential assuming implementation of all locally cost-effective measures is approximately five times greater than from assuming the historic rate of BMP implementation.
- Efficiency codes are a significant source of water savings for the urban sector. Codes related to toilet, showerhead, and washer efficiency, as well as codes

4. The UWMPA is a piece of California legislation, while CVPIA is federal legislation. The Sacramento Water Forum Agreement is a regional initiative.

5. ROD, pg. 60.

6. ROD, pg. 64.

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TABLE 1.2 CBDA ESTIMATES OF 2030 URBAN CONSERVATION SAVINGS POTENTIAL

Projection Level (PL)	Local Agency Investment Assumption	CALFED Grant Funding Assumption	Efficiency Code (acre-feet/year)	Local Agency (acre-feet/year)	Grant Funded (acre-feet/year)	Total Projected Savings (acre-feet/year)
1	Historic Rate	Proposition 50 only	970,000	172,000	11,000	1,153,000
2	Locally Cost-Effective	Proposition 50 only	970,000	881,000	11,000	1,862,000
3	Historic Rate	Proposition 50 + \$15 million/year	970,000	172,000	257,000	1,399,000
4	Locally Cost-Effective	Proposition 50 + \$15 million/year	970,000	881,000	257,000	2,108,000
5	Locally Cost-Effective	Proposition 50 + \$40 million/year (2005–14) \$10 million/year (2015–30)	970,000	881,000	224,000	2,075,000
6*	N/A	N/A	N/A	N/A	N/A	3,096,000

* Projection 6 estimated the technical potential of the urban conservation measures evaluated by CBDA. It assumed 100% adoption statewide of these measures and provided a reference point for the other five projection levels.

that require metering customer water connections are essential to realizing the projected water savings potential. Efficiency codes account for 46% to 84% of total savings for projections 1 through 5.

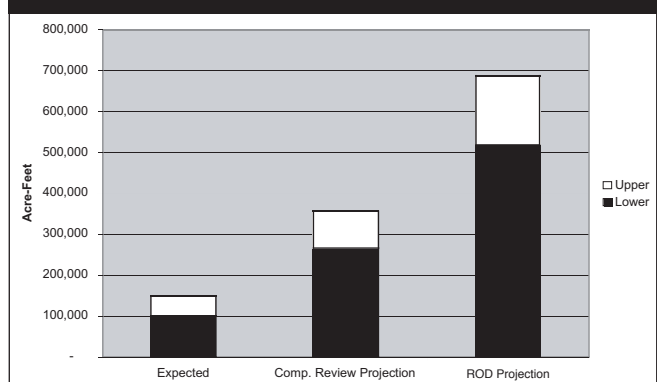
- Although grant funded water savings account for only a small percentage of total savings potential, they leverage significant additional local investment, can act as an investment catalyst, help to promote regional partnerships and joint ventures, and increase the geographic base of implementation.

EXPECTED STAGE 1 WATER SAVINGS

Regarding Stage 1 urban sector water savings potential, the Comprehensive Review concluded the following:

- The ROD estimates of Stage 1 urban savings potential appear to be overstated. Modeling done for the Comprehensive Review suggests that local implementation of cost-effective conservation measures coupled with state/federal funding amounts put forward by the ROD could produce, under ideal circumstances, upwards of 475,000 acre-feet of water savings by the end of Stage 1—about 91% of the lower-bound ROD estimate of urban savings potential.
- Urban sector water savings by the end of Stage 1 are expected to fall well short of the both the ROD and Comprehensive Review Stage 1 estimates of savings potential. Figure 1.2 compares expected water savings by the end of Stage 1 based on the review of the first four years of urban WUE implementation to the ROD and Comprehensive Review estimates of Stage 1 savings potential.
- Adopting less aggressive local implementation assumptions would put the expected savings range

FIGURE 1.2 URBAN STAGE 1 WATER SAVINGS: EXPECTED VS. PROJECTED



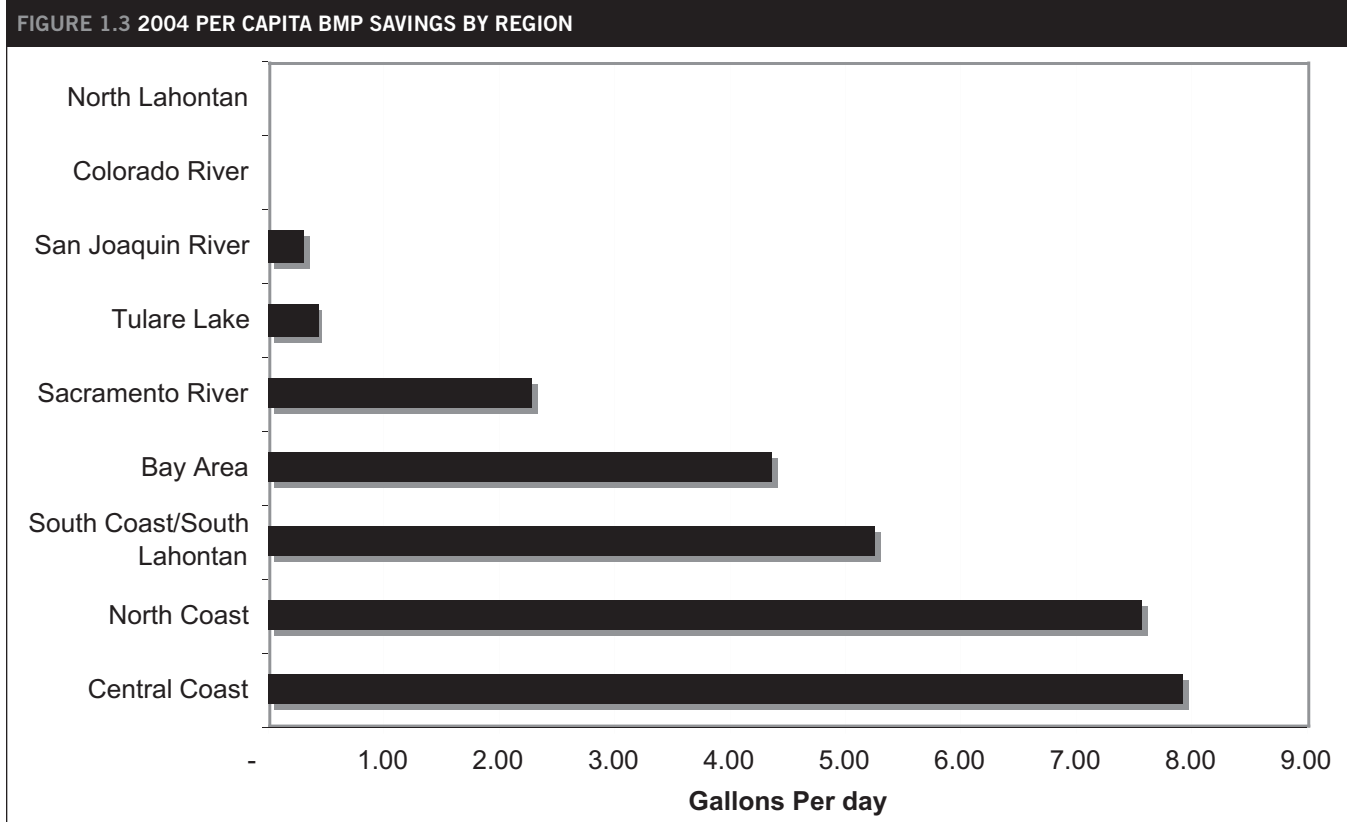
between 267,000 and 356,000 acre-feet—about 50% to 70% of the lower-bound ROD estimate of Stage 1 urban savings potential. Although considerably below the ROD projection, this volume of water savings is nonetheless sizeable.

- Stage 1 urban sector annual savings are expected to range between 101,000 and 150,000 acre-feet, about 39% of the conservative Comprehensive Review Stage 1 projection, and about 20% of the ROD Stage 1 projection.

URBAN WUE PROGRAM OUTCOMES

The Comprehensive Review found that expected water savings by the end of Stage 1 are likely to fall short of estimated potential. Urban sector savings were to come from two sources: implementation of locally cost-effective BMPs per the Urban MOU; and implementation of additional conservation measures funded in part via state/federal grants. In both instances, the Comprehensive Review found substantial discrepancies between planning assumptions upon which

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estimates of Stage 1 savings potential were based and actual implementation.

Urban MOU Implementation

Water savings from urban BMP implementation have grown steadily since the Urban MOU was first adopted in 1991. By 2004, the last full year of BMP data, annual water savings were approximately 180,000 acre-feet. Since 1991 annual water savings have increased by 15% to 20% per year, according to data from the California Urban Water Conservation Council (CUWCC).⁷

The impact of the Urban MOU on water use, however, has varied considerably by region and rates of compliance for most BMPs remains low, as shown by Figures 1.3 and 1.4. Addressing uneven rates of BMP implementation and assuring statewide compliance with the Urban MOU process were important Stage 1 WUE Program objectives stipulated by the ROD. These objectives have yet to be met.

The ROD called on CALFED Agencies to implement a process to certify water supplier compliance with the Urban MOU by the end of 2002. It further stated that access to CALFED Agency grant funding should be conditional on compliance with the Urban MOU once the certification process

was in place. To date, these ROD provisions concerning Urban MOU compliance have not been implemented.

A framework for certifying water supplier compliance with the Urban MOU was completed in June of 2002 and put before the Bay-Delta Public Advisory Committee (BDPAC) for action in August of 2002. While BDPAC engaged the topic during its August meeting, it chose to take no action on the proposal, citing unresolved technical issues, water supplier concerns about unbalanced implementation of the CALFED Program, and questions about the efficacy of making the voluntary Urban MOU process into a quasi-regulatory program.

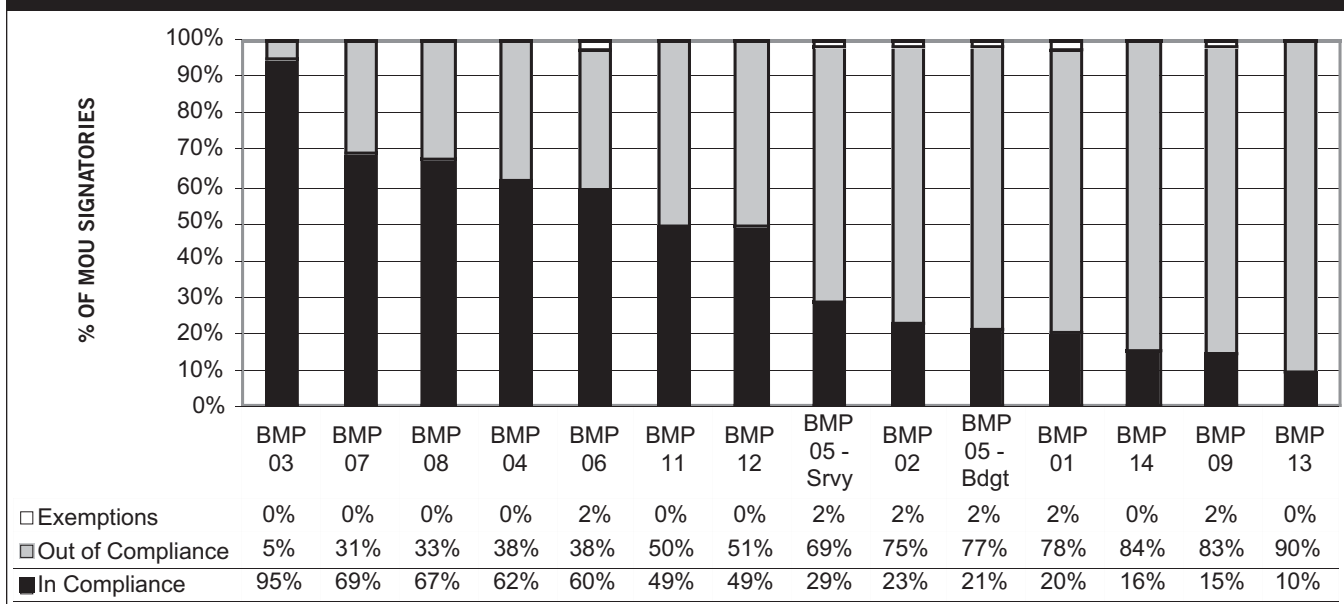
Because CALFED Agencies have not adopted a process to certify compliance with the Urban MOU, the second ROD stipulation that grant funding be made conditional on compliance also has not been put into effect.⁸ Grant eligibility is conditional on having filed an Urban Water Management Plan with DWR, but this requirement does not ensure Urban MOU compliance. CALFED Agencies have not set a timetable for linking grant eligibility to Urban MOU compliance, though the ROD expected such a linkage by the beginning of 2003.

Whether the proposed certification program would have resulted in greater rates of compliance with the Urban MOU and implementation of the BMPs is uncertain. What the available data clearly indicate, however, is that the voluntary Urban MOU process is not functioning as originally intended.

7. While an annual growth rate of 15% to 20% is an important accomplishment, both the look-forward analysis and data on current MOU compliance rates suggest significant remaining conservation potential in the urban sector.

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FIGURE 1.4 URBAN MOU BMP COMPLIANCE RATES AS OF 2002



- Very few MOU signatories follow the BMP exemption process when they choose not to implement BMPs. The rate of exemption filings ranges between 0–2% of water suppliers. While the exemption process is a cornerstone of the voluntary Urban MOU, BMP implementation data clearly show the process is not working as intended.
- The proportion of signatories out of compliance with BMP requirements equals or exceeds 50% for nine BMPs. Non-compliance rates are highest for BMPs requiring significant customer interaction and water supplier financial commitment—BMPs 1, 2, 5, 9, and 14. These are also the BMPs expected to produce the most water savings.
- None of the water suppliers with large numbers of unmetered connections are complying with BMP 4.⁹
- Non-reporting or incomplete reporting of BMP activity remains a problem. Reporting rates, while improving over time, are still low. Like the exemption provisions, BMP reporting was considered a key part of the voluntary Urban MOU. Here too, the data suggest the process is not working as intended.
- Overall, the data show that most Urban MOU signa-

tories do not voluntarily comply with the Urban MOU process. Few submit exemptions for the BMPs they are not implementing and few are complying with most of the BMPs.

Urban WUE Loan/Grant Program

The second component of the WUE program for the urban sector was a competitive loan and grant program to support local implementation of BMPs. The WUE Preliminary Implementation Plan budgeted \$350 million through Stage 1 for urban loans and grants. Outcomes of urban WUE loan/grant program to date have been as follows:

- A competitive PSP process for urban grants was developed by CALFED Agencies and has operated successfully over the first four years of Stage 1.
- CALFED Agencies have not developed an analogous urban loan program to support implementation of locally cost-effective BMP implementation. It is unclear whether there is local demand for such a program.
- Through 2004, the urban PSP grant program has funded 122 urban conservation implementation, research, and education projects. \$50.5 million in grant funding has been awarded over this period. Funded projects have expected annual water savings of about 37,000 acre-feet. Accounting for the lag between funding and implementation, approximately 40% of this savings will be on line by the end of Stage 1.
- Urban conservation projects funded by the PSP process account for between 16–19% of total expected water savings through the first four years of Stage

8. On page 60 the Record of Decision states: "Water agencies must implement water use efficiency measures that are cost-effective and appropriate at the local level. This level of attainment will be defined by agency compliance with the AB 3616 Agricultural Water Management Plans (for agricultural districts) or implementation of applicable Urban Water Conservation Council "best management practices" (for urban districts). CALFED Agencies anticipate that State and Federal assistance to agencies to attain this base level of water use efficiency will generally be in the form of technical assistance and capitalization loans, not grants. In addition, access to further CALFED Water Use Efficiency Program benefits (e.g., grants) will be conditioned on agency implementation of the applicable water management plans."

9. Passage of state metering legislation last year, which requires metering of all urban connections by 2025, is likely to change this situation, albeit slowly.

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1. The other 81–84% of expected savings are a result of unassisted local implementation.

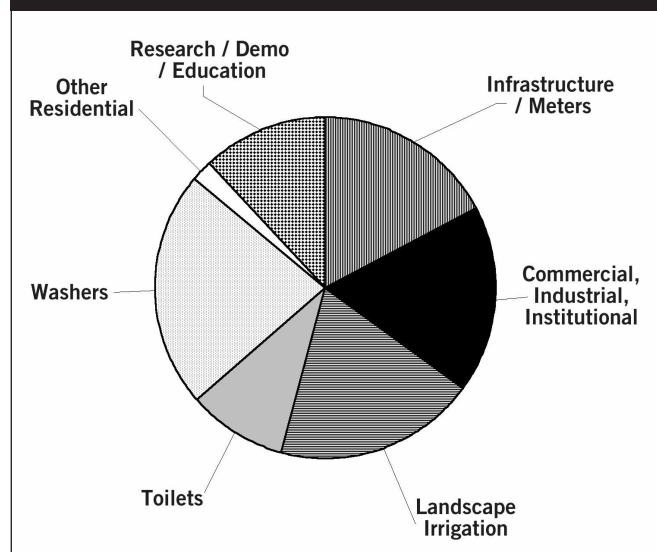
- State/federal funds for urban grants through Stage 1 are expected to be about 23% of funding amounts set forth in the ROD. Funding requests from urban water suppliers have exceeded available state/federal funds by a ratio of about eight-to-one during the first four years of program implementation.
- Comprehensive Review results suggest that had the urban PSP program received full Stage 1 funding it could have resulted in 125,000 acre-feet of water savings by the end of Stage 1.
- Most funding has been for implementation projects rather than research, demonstration, or education. Of the \$50.5 million awarded between 2001 and 2004, \$44.5 million has been awarded to implementation projects. Grant funding has addressed all aspects of urban water use. The distribution of grant awards by conservation activity is shown in Figure 1.5.
- While unit costs for many funded projects have been higher than anticipated by the ROD, on average the cost per acre-foot of expected water savings, as reported by grant applicants, has ranged between \$160 and \$390 per acre-foot. The average unit cost of savings for the urban PSP program is within the expected cost range of \$150 to \$450 per acre-foot cited in the ROD.

On balance, the urban PSP program has followed ROD guidance in some respects and not in others.

- It has implemented a competitive PSP process that evaluates both local and statewide benefits of proposed projects.
- The average costs of funded projects are within the cost range expected by the ROD, though the program has shown a tendency to fund many small to medium scale projects with high unit costs and may be forgoing opportunities for economies of scale.¹⁰
- The program has not implemented a loan program to support implementation of locally cost-effective conservation measures. In two out of four funding years, it has used grants to fund locally cost-effective projects even though the ROD stipulated that grants should not be used for this purpose.
- The program has not conditioned grant funding on compliance with the Urban MOU, though it has con-

10. Reversing this tendency potentially could increase the efficiency of the program, but might impact the ability of smaller communities to effectively compete for grant funds. Currently the program is structured to increase the likelihood of funding projects in small economically disadvantaged communities.

FIGURE 1.5 URBAN GRANT FUNDING ALLOCATION: 2001–2004



ditioned it on compliance with the UWMPA.

- PSP program funding has fallen far short of ROD levels. By the end of Stage 1, PSP program funding is expected to be only 23% of the ROD target.

CONSIDERATIONS FOR MOVING FORWARD

The results of the Comprehensive Review suggest several considerations for moving forward with the urban WUE program.

- The Comprehensive Review's projections of urban water savings potential affirm the important role urban demand management could play in managing the state's water resources over the next several decades. Savings potential from the range of local and state/federal investment considered by the Comprehensive Review is 1.2 to 2.1 million acre-feet.
- Realization of this potential depends critically on local implementation of conservation measures. The existing, purely voluntary Urban MOU process is not working as intended. While the ROD called for a process to certify water supplier compliance with the Urban MOU, and BDA staff developed a framework for such a process, it has yet to be implemented. Going forward, CALFED Agencies need to consider carefully the role the Urban MOU plays in local implementation of conservation and whether changes to this process would allow the state to tap into the considerable water savings potential identified by the Comprehensive Review's analysis of savings potential.
- The Comprehensive Review also highlighted the important role played by efficiency codes. Once in place, these codes provide an automatic and on-going source of water savings to the state at minimal costs.

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Going forward, CALFED Agencies need to consider the relevance and effectiveness of existing efficiency codes and encourage development of other efficiency codes where practical.

- The Comprehensive Review suggests that state/federal financial assistance programs play an important but limited role. By themselves they are unlikely to allow the state to realize the upper-end of the range of savings potential. In conjunction with policies promoting implementation of locally cost-effective conservation measures, however, state/federal financial assistance can leverage additional local investment in conservation, promote the most promising and cost-effective conservation technologies, and help to forge regional and statewide urban conservation initiatives. The existing PSP process is meeting some of these objectives, but also may be foregoing important scale economies by funding many small projects rather than fewer large projects. Results of the Comprehensive Review suggest a rebalancing may be needed between funding as many applications as possible with available funds and economic efficiencies associated with larger-scale projects.

RECYCLING AND DESALINATION

INTRODUCTION TO WASTEWATER RECYCLING AND DESALINATION COMPREHENSIVE REVIEW

The recycling and desalination comprehensive review is in two parts. The first part provides a review and evaluation of the first four years of recycling and desalination implementation. The review discusses the role of recycling as described by the CALFED ROD; the structure of the recycling program; implementation of this program; and program results over the first four years of implementation and anticipated by the end of Stage 1 of the CALFED Program. The second part provides an analysis of recycling and desalination potential based on a reasonably foreseeable level of state and federal funding. Although desalination is not covered in the CALFED ROD it is included in this analysis.

RECYCLING PROGRAM STRUCTURE AND STAGE 1 SAVINGS POTENTIAL ENVISIONED BY ROD

The CALFED ROD states that the goal of the WUE Program is to accelerate the implementation of cost-effective actions to conserve and recycle water throughout the State. The ROD recognizes that WUE can have water supply benefits, water quality benefits, and in-stream flow and timing benefits. The ROD calls for the implementation of WUE initiatives to achieve these benefits.¹¹ The ROD calls for the CALFED Agencies to implement a competitive grant and loan pro-

gram as the best mechanism to assure cost-effective investments in water use efficiency. It further states that:

- Loans and technical assistance are appropriate to help local agencies pursue locally cost-effective WUE.
- Grants are appropriate to pursue WUE that, while not locally cost-effective, provide additional statewide benefits, including water supply, water quality, and in-stream flow and timing.
- CALFED agencies should tailor the required local cost-share requirements to reflect the distinction between local and statewide benefits of a funded project.
- Each grant and loan package must include specific requirements for performance and accountability.

Additionally, the ROD directed that:

- The WUE program shall develop recommendations for appropriate measurement of water use and submit them to the Legislature for action.
- The WUE program shall develop a finance plan for completion of Stage 1 actions.
- CALFED Agencies will conduct a comprehensive evaluation of the Program's first four years.

LONG-TERM RECYCLING AND DESALINATION POTENTIAL

The Comprehensive Review's projection of recycling and desalination potential strongly supports the position that aggressive investment in recycling can result in significant water supply benefits through 2030. The projection evaluated recycling potential based on an assumption of reasonably foreseeable funding through Proposition 50 and local sponsorship of projects.

The approach taken in the recycling and desalination potential analysis was to work with stakeholders to develop a listing of all recycling and desalination projects. Several efforts were made to refine the listing; however, the reader is cautioned that the project listings are not definitive and includes many projects that may be speculative.

The recycling list indicates that there are 730 projects throughout the state with 565 projects reporting a yield of over 3 million acre-feet. There are 100 projects that list capital cost information totaling \$2.1 billion. The desalination list indicates that there are 174 projects throughout the state with 173 projects reporting a yield of over 1.6 million acre-feet. There are 39 projects that list capital cost information totaling \$2.13 billion. A potential funding source for recycling and desalination projects is Chapter 8 of Proposition 50 contains that contains \$380 million in funding

11. ROD, pg. 59.

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capacity for integrated regional water management. It is assumed that these funds are available for both demand management and supply augmentation however at this time there is no basis for allocating the funding and therefore no projections of future projects are made.

EXPECTED STAGE 1 RECYCLING AND DESALINATION RESULTS

Regarding Stage 1 recycling and desalination potential, the Comprehensive Review concluded the following.

- Figure 1.6 shows benefits from recycling are expected to range from 387,000 to 513,000 acre-feet. This is almost double the low end of the Stage 1 estimates. The difference between the ROD estimates and the comprehensive review estimates may be due to the fact that funding for the first four years was greater than the ROD estimate.
- No results or applicant-claimed benefits are available from the Proposition 50 funding that was allocated in Year 4. Assuming that there are yield benefits from these projects, this will increase the overall recycling amount.

CONSIDERATIONS FOR MOVING FORWARD

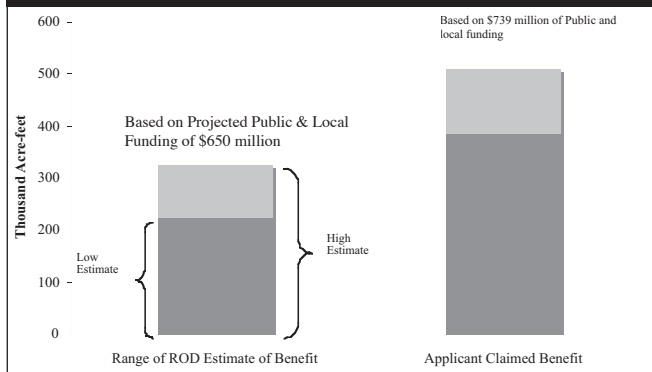
The results of the Comprehensive Review suggest several considerations for moving forward with the recycling and desalination program.

- The Comprehensive Review's projections of recycling potential affirm the important role that water management can play in managing the state's water resources over the next several decades. Based on a tentative project listing the recycling potential is greater than 3 million acre-feet. Based on the tentative desalination listing there are about 1.6 million acre-feet of potential new yield.
- The Comprehensive Review suggests that state and federal financial assistance programs play an important role in affecting WUE. On their own, grant programs are unlikely to allow the state to realize the upper-end of the range of the WUE potential. In conjunction with policies promoting implementation of locally cost-effective recycling, state and federal financial assistance can leverage additional local investment to promote the most promising and cost-effective actions.

RECOMMENDATIONS

The analysis and associated findings and considerations suggest that agencies responsible for the WUE Program may want to consider changes in the way the program is implemented.

FIGURE 1.6 COMPARISON OF ROD ESTIMATES FOR RECYCLING THROUGH STAGE 1 AND APPLICANT-CLAIMED BENEFITS



Below are specific recommendations that the consultant Team believes merit serious consideration. Any final approach is best considered as part of a dialogue that brings the affected stakeholder community to the table in a transparent series of discussions.

PROGRAM STRUCTURE/ASSURANCES

Recommendation 1: Assess viability of WUE approach given expected fiscal constraints.

The ROD proposed a WUE program unprecedented in its scope, magnitude, and funding. Expectations of program performance were predicated on sizable amounts of state and federal financial assistance to local implementing agencies. Only a small fraction of the funding proposed in the ROD has actually materialized and present state and federal fiscal conditions strongly suggest further diminishment in future funding. The CALFED Program needs to determine whether a minimally funded approach is sufficient to meet WUE and broader CALFED Program objectives.

Recommendation 2: Decide whether to implement a process to certify compliance with the Urban MOU.

Findings from the Comprehensive Review clearly indicate the current voluntary MOU process is not working and that water savings from implementation of locally cost-effective conservation measures are well below full potential. As envisioned by the ROD, a process to certify water supplier compliance with the Urban MOU was a key assurance for realizing water savings from locally cost-effective conservation measures. Urban MOU certification is currently in limbo. Following release of the CBDA staff recommendation, no further progress on implementing a certification program has been made, but neither has the idea been officially discarded. The decision whether or not to move forward with certification is pivotal. Moving forward with certification will require substantial commitments by the CALFED Program,

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implementing agencies, and stakeholders to develop and implement an effective, fair, and robust process. A decision not to move forward with certification will require very different but no less substantial commitments to craft a new approach for assuring a high level of local investment in urban water use efficiency.

Recommendation 3: Revisit effectiveness of quantifiable objectives approach and associated assurances.

As articulated in the Record of Decision, quantifiable objectives were to serve as the foundation of the agricultural water use efficiency program. Local actions were to be targeted at achieving quantifiable objectives. Grant funding was to be prioritized for agencies delivering quantifiable objectives results at the local level. And a broadly supported assurances package was to be used to assess progress towards quantifiable objectives implementation. The Comprehensive Evaluation suggests mixed success over the past few years. While some local water agencies have actively sought grant funding to pursue quantifiable objectives and the Bureau of Reclamation has successfully embedded quantifiable objectives into its regional criteria, other key elements have fallen far short of expectations and needs. Only one-quarter of the quantifiable objectives have been articulated, outreach to local agencies has proven more challenging and time-consuming than anticipated, and significant grant-funding has been awarded to projects not promising to meet quantifiable objectives. Implementing agencies need to tackle this issue head-on. If quantifiable objectives are to play a pivotal role, deficiencies in the current implementation approach must be addressed. If quantifiable objectives are to be diminished in importance, a new approach—and associated assurances—must be crafted and put into place.

MONITORING PERFORMANCE

Recommendation 4: Develop specific performance measures for WUE Program.

The WUE Program has yet to articulate a comprehensive set of performance measures that it will use to evaluate program performance and determine whether the program is meeting stated objectives. These measures are needed if the program is to successfully adapt to changing circumstances and make mid-course corrections. The program needs to identify several key performance measures for each of its several program areas. These measures should address water savings, cost-effectiveness, and supply-reliability, water quality, and ecosystem benefits derived from WUE investments.

Recommendation 5: Proceed with measurement proposal.

Efforts to assess and project water use efficiency potential are seriously constrained by the lack of credible and comprehensive water use measurement data, particularly in the agricultural sector. Consistent with the ROD, the CBDA last year developed a proposed package of legislative and administrative actions intended to improve the state's collection of basic agricultural and urban water use measurement data. This package—broadly supported by stakeholders yet still awaiting action—needs to move forward if the State is to craft water management policy informed by current water use.

Recommendation 6: Improve collection of data on locally funded actions.

The Comprehensive Evaluation was greatly hampered by the lack of data related to locally cost-effective agricultural water use efficiency actions. Without reliable data on locally funded actions, it is not possible to credibly assess and project the potential contributions agriculture can make to the state's water management needs. The State should work with the AWMC and other interested parties to develop a reliable and comprehensive system for tracking locally cost-effective investment and results. The BMP reporting database developed by the CUWCC provides one example of how data can be efficiently collected from a wide array of implementing agencies throughout the state.

Recommendation 7: Revise the grant process to monitor, verify and track results.

To date, the grant process has relied on recipients to report expected benefits of proposed projects. Only minimal effort has been made to monitor, verify and aggregate results in a usable database. As a result, the Program cannot accurately assess the impact of water use efficiency actions and better target future grant funding. WUE implementing agencies should put in place mechanisms to develop baseline and project-level implementation data to report on WUE activities occurring at the local level. For example, when implementing a canal lining action there needs to be project level data that informs the quantity of pre-project seepage and the reduction in seepage once the action is implemented. Furthermore, program-wide baseline data is not available and therefore an understanding of progress toward meeting in-stream flows, water quality and water supply reliability objectives is not possible. Examples of program-wide data are cumulative changes in district diversions, basin-wide ET changes or changes in in-stream flows. The grant-tracking database developed by the CALFED Ecosystem Restoration Program could provide a possible model for this effort.

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FINANCIAL ASSISTANCE PROGRAMS

Recommendation 8: Revisit grant program structure and protocols.

Experience with the grant program to-date spotlights several issues important to address. Will agencies target grant dollars at beyond locally cost-effective actions only or will funding be made available for locally cost-effective projects? Is it important to award grants evenly across the state and among different-sized local water agencies or is it a greater imperative to target those projects capable of delivering the greatest statewide benefits? To what extent is it appropriate to limit grant funding to only those actions deemed consistent with AWMC or Urban MOU compliance? These and related issues should be openly engaged and resolved—with stakeholder input—prior to the next grant-funding round.

Recommendation 9: Determine the need and efficacy of urban and agricultural loan programs.

The ROD proposed using low-interest loans rather than grants to assist agencies implementing locally cost-effective WUE measures. This was seen as one way to reduce implementation barriers, particularly for smaller or lower-income communities. To date, the WUE Program has not implemented an urban loan program and it remains unclear whether there is either broad or specific demand for one. A loan program for agricultural WUE projects was developed, but there has been no demand for it. The current lack of demand for low-interest loans may point to a mismatch between policy and local need, but it also may be primarily a function of the credit environment over the last half-decade. The CALFED Program should assess the viability and efficacy of urban and agricultural loan programs. This assessment should consider under what credit market conditions there would be broad demand by local implementing agencies for a low-interest loan program; whether a low-interest loan program would provide sufficient financial assistance to economically disadvantaged communities implementing locally cost-effective WUE measures; and more generally, whether WUE financing presents a significant implementation barrier that can be effectively addressed through a loan program.

TECHNICAL ASSISTANCE AND RESEARCH

Recommendation 10: Conduct market assessment to determine appropriate structure and scope of technical assistance programs and develop strategic plan.

The ROD outlined an ambitious WUE technical assistance program to address local implementation barriers, disseminate information and research findings, and help local agencies develop effective WUE programs. To date, technical assistance efforts have consisted of a patchwork of programs and outreach. Roles and responsibilities among the CALFED implementing agencies are minimally defined and coordination has been minimal. A bottom-up assessment of the need, type, scope, and delivery of technical assistance is needed. One possible approach is to begin with a survey of potential technical assistance recipients to determine what type of programs and delivery mechanisms would best serve their needs. Results from such a survey could support development of a technical assistance strategic plan that would more clearly articulate program goals, organization, coordination, costs and funding.

Recommendation 11: Evaluate WUE research funded to-date, identify research priorities for next program stage, and establish protocols to disseminate research findings.

The ROD envisioned a robust WUE research program to support local implementation of conservation programs and to ensure that information on the latest WUE technologies and methods was widely disseminated. In addition, the CALFED water measurement proposal included a stakeholder-supported list of focused research needs. While a variety of research has been undertaken over the first four program years, it has not been guided by an explicit set of research priorities and objectives. This has resulted in a piecemeal approach that has made it difficult to determine if the program is directing research dollars to the best areas of inquiry. While a Science Application Advisory Committee was established to guide WUE research, the program has not effectively utilized it. As a first step, a review of research funded to date is needed. This assessment could then support a more comprehensive assessment of research needs and priorities for the next stage of implementation. Lastly, the program needs to consider how best to ensure that information developed through research makes a practical difference in meeting program objectives. A key element here will be ensuring that research findings of significance are translated into pragmatic program guidance and broadly disseminated to local implementing agencies.